

**REMARKS**

The foregoing amendment amends claims 1, 12, 20, 30, 32, 39, 40, 43 and 46-48 and adds new claim 49. Pending in the application are claims 1-3, 5-24 and 26-49, of which claims 1, 12, 30, 32, 39, 40, 43 and 46-48 are independent. The following comments address all stated grounds for rejection and place the presently pending claims, as identified above, in condition for allowance.

Claims 1, 12, 30, 32, 39, 40, 43 and 46-48 are amended to specify that each fluid interface port has a depth equal to a thickness of an associated side wall and a diameter that is significantly larger than the depth so as to minimize a total volume of the fluid interface port. Support for the amendment can be found throughout the application as originally filed, at least, for example on page 9, first full paragraph (lines 14-24), page 11, first paragraph and as shown in Figures 4A and 4B.

Claim 20 is amended to specify that the number H includes a number of cathode holes and a number of anode holes.

Claims 46-48 are further amended for purposes of clarity, to address the objections raised by the Examiner. In particular, claims 46 and 48 to clarify a single channel and claim 47 is amended to recite a plurality of channels.

New claim 49 depends from claim 1 and further specifies that meniscus is substantially co-planar with the wall of the separation channel in which the meniscus is formed, as described on page 10, lines 6-7 of the original specification and as shown in Figures 4A and 4B. *No new matter is added.*

Amendment and/or cancellation of the claims is not to be construed as an acquiescence to any of the objections/rejections set forth in the instant Office Action, and was done solely to expedite prosecution of the application. Applicant reserves the right to pursue the claims as originally filed, or similar claims, in this or one or more subsequent patent applications.

**Supplemental Information Disclosure Statement**

Applicants include herewith a Supplemental Information Disclosure Statement citing references cited during the prosecution of U.S. Patent Application Serial Number 10/028,852 (Attorney Docket Number TGZ-001A), U.S. Patent Application Serial Number 10/027,484 (Attorney Docket Number TGZ-001B) U.S. Patent Application Serial Number 10/027,516 (Attorney Docket Number TGZ-001C) and U.S. Patent Application Serial Number 10/607,287 (Attorney Docket Number TGZ-00ACP2), which are currently being prosecuted before the United States Patent and Trademark Office and also relate to the present application.

**Claim objections**

Regarding the objection to claims 46-48, Applicants have amended claims 46, line 3 and 48, line 3 to change the phrase “each of said separation channels” to --said separation channel--, which has proper antecedent basis. In addition, in line 5 of claim 48, “channels” has been changed to --channel--. Regarding claim 47, Applicants have amended the claim to recite a plurality of separation channels to which the cathode reservoir is multiplexed.

**Claim rejections under 35 USC § 112**

Regarding the rejection of claim 20 under 35 U.S.C. 112, Applicants have amended the claim to specify that H is equal to the number of samples plus a number of cathode ports and anode ports.

**Claim rejections under 35 USC § 103**

In the Office Action, the Examiner maintains and makes final the rejection of claims 1-3, 5-24 and 26-45 under 35 USC §103(a) as being unpatentable over Simpson *et al* in view of Howitz *et al.* and, with regards to claims 9-11, 29-29 and 37, in further view of Bjornson *et al.* or Sundberg *et al.* The Examiner also rejects claims 46-48 for the same reasons. As previously argued, the cited references, alone or in combination, do not teach or suggest a separation device including one or more fluid interface ports, each having a dead volume of less than about one *picoliter*, formed in the side wall of a separation channel having a virtual wall formed by a separation medium disposed in the interior of the separation channel, as recited in independent claims 1, 12, 30, 32, 39, 40, 43 and 46-48.

However, to expedite prosecution and allowance of the present application, Applicants have amended the independent claims to specify that each fluid interface port has a depth that is substantially less than the diameter of the fluid interface port to minimize overall volume. The recited fluid interface ports thus have a disk shape, as shown in Figure 4A, and described on page 9, line 20, to facilitate *direct* access to the channel interior. In contrast, the fluid microdiode of Howitz includes a capillary channel having a depth that is significantly *larger* than the cross-section of the channel, which prevents direct interfacing of the channel interior with the ambient. In fact, the Howitz capillaries 6 have a depth (150  $\mu\text{m}$ ) that is about **three** times larger than the cross-sectional dimensions (50  $\mu\text{m}$ ) of the capillaries, as set forth in column 3, lines 14-15 and as shown in the figure of Howitz. The additional cited references also do not disclose the claimed fluid interface port having the recited configuration. Therefore, claims 1-3, 5-24 and 26-48 distinguish patentably over the cited references.

Furthermore, on page 15 of the Office Action, the Examiner states that the dead volume of the fluid microdiode in Howitz is variable and that, therefore, the Howitz reference contemplates a dead volume of less than one picoliter or zero, as recited in claims 1-3, 5-24 and 26-48. Applicants respectfully disagree and submit that the Howitz reference teaches away from varying the dead volume to a volume that is less than one picoliter, because the Howitz reference specifically *requires* the target fluid to fill the entire volume of the capillary, which is significantly larger than one picoliter. For example, on column 2, lines 6-7 and column 3, lines 26-27, the Howitz reference specifies that the “target fluid will spread up to capillary ends.” (See also column 3, lines 26-27 of Howitz). The Howitz reference requires that the target fluid employ the “total area” of the capillary opening (column 3, lines 30-31), in contrast to the Examiner’s assertion. Therefore, the Howitz reference does not teach, and in fact teaches away from a fluid interface port comprising a virtual wall and having a dead volume of less than one picoliter, as recited in claims 1-3, 5-24 and 26-48.

The virtual wall forms a *direct* interface between the microchannel interior and the microchannel exterior, allowing direct access to the liquid in microchannel without introducing dead or unswept volume in the microchannel. In contrast, capillaries in the Howitz reference do not *directly* interface a microchannel to the environment surrounding the device, because of the

relatively large length of the capillaries. Furthermore, the spacer chip 2 forms an intermediate interface between the capillaries and the exterior, further preventing a direct interface.

The virtual wall of the claimed invention also serves to seal liquid inside of the microchannel through a range of pressures in the microchannel. There is no teaching or suggestion that liquid is sealed in the device by the capillaries of Howitz.

Furthermore, Applicants maintain that the Examiner has not pointed to an adequate and objective reason for combining the cited reference in rendering the conclusion that claims 1-3, 5-24 and 26-48 are obvious. According to the Examiner on page 15 of the Office Action, the teaching in Simpson of “one way of performing a necessary function does not constitute teaching away from any modification.” However, Applicants maintain that the Simpson reference does teach away from having a fluid interface port that minimizes dead volume because the reference specifically seeks to achieve an opposite effect i.e., the *maximization* of the volume of the reservoirs storing a sample, as set forth in column 3, lines 12-21 of the Simpson reference.

Even so, the Howitz reference does not disclose a virtual wall fluid interface port formed in a side wall of a microchannel and having a dead volume of less than one picoliter and/or a diameter that is significantly larger than the depth so as to minimize a total volume of the fluid interface port, as recited in independent claims. In fact, the Howitz reference also teaches *away* from the claimed invention. Therefore, even in combination, the claims distinguish patentably over the cited references.

In addition, the cited references do not disclose a meniscus that is co-planar with a side wall of a channel, as recited in new claim 49. Rather, as shown in the figure of Howitz, the meniscus is formed only in a top portion of the capillary and does not align with the side wall in which the capillaries are formed.

For at least these reasons, Applicants respectfully submit that all pending examined claims are patentable, and request that the objections and rejections be reconsidered and withdrawn.

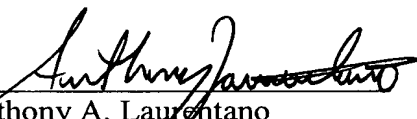
**CONCLUSION**

In view of the above amendment, applicant believes the pending application is in condition for allowance.

Applicant believes no fee is due with this statement. However, if a fee is due, please charge our Deposit Account No. 12-0080, under Order No. TGZ-007 from which the undersigned is authorized to draw.

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Respectfully submitted,

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